

Groundwater Resources and Quality

1. INTRODUCTION

1.1 Background

The Jordan Badia Research and Development Programme was established in 1992 as a collaborative venture between the Higher Council for Science and Technology of Jordan (HCST) and the British Royal Geographical Society (RGS). The aim of the programme is:

"the sustainable development of the desertified Badia environment and the improvement of the standard of living of the inhabitants... under management systems which conserve the natural resources so that production levels will be sustainable in the long term." (RGS, 1992)

As most of this vast arid area has an average annual rainfall of 100 to 150 mm, sustainable development requires a lasting supply of groundwater of a suitable quality for irrigation, human consumption and for livestock. However,

"the exploitation of most groundwater aquifers beyond their safe yield is causing depletion and salination of the water and this practice should be stopped before permanent and irreversible damage occurs". (HCST, 1993)

The Badia Research and Development Programme has identified the N.E. Badia region as a pilot study area which is almost geographically coincident with the Azraq Basin, as shown by Figure 1.

1.2 Objectives of the report

This report reviews the principal results and conclusions to date on the quantity and quality of the groundwater resources in the Badia pilot project area. It is based mainly on the work of two postgraduate students at University College London (UCL), David Drury and Beatrice Gibbs, who carried out research projects as part of their MSc degrees in Hydrogeology in 1993. Their reports on the hydrogeology and hydrochemistry of the north-eastern Badia have been prepared as MSc theses (Drury, 1993 and Gibbs, 1993).

The aim of the report is to summarise the main findings of the research, combining the conclusions from both the hydraulic and hydrochemical aspects of the study into a coherent statement of the current knowledge of the Badia's groundwater resources. The second objective is to use the results to highlight the critical gaps in the existing database, and to make recommendations for future research to investigate the areas of uncertainty. Looking forward to the implementation of the Badia development programme, preliminary recommendations on the sustainable development of water resources are also included.

1.3 Programme of Work

As part of the Geomorphology and Physical Resources component of the Badia Research and Development Programme, David Drury and Beatrice Gibbs worked full-time for five months. The programme of work was:

5 May - 25 May 1993

Review of background information and preparation for fieldwork

26 May - 30 June 1993

Fieldwork and data collection in Jordan

1 July - 30 September 1993

Analysis, interpretation and preparation of reports.

The work was supervised by Jane Dottridge and William Burgess at UCL, with assistance in planning and organising the fieldwork in Jordan from Robert Allison and Roderic Dutton in the UK and Dr AbdurRahman Al-Fataftah in Jordan. Support and guidance during the fieldwork in Jordan were provided by Dr Al-Fataftah and members of the Badia project staff, Dr Bassam Sunna of the Natural Resources Authority (NRA), Roderic Dutton and staff from the Water Authority of Jordan (WAJ). Supervisory visits to the project area by the British team were made as follows:

25 May - 3 June

Robert Allison

11 June - 23 June

Jane Dottridge.

2. INVESTIGATION OF GROUNDWATER RESOURCES

2.1 Previous and Current Work by other organisations

Over the past thirty years, numerous studies of water resources have been conducted in the north-east Badia, particularly concentrating on the upper aquifer in the Azraq basin. The main reports and compilations of data from previous studies are listed in the reference list. Many have been reviewed extensively in the past, for instance by Hydrogeological Services International (HSI) in 1988. The previous work was used as the basic data for the current research and as a starting point for the collection of additional data, but the interpretations were reviewed critically in the light of recent, additional information.

There are at least four other groups currently working on projects which are collecting data relevant to the water resources of the Badia project area:

- WAJ
 - regular monitoring and sampling
 - well inventory and abstraction estimates in Azraq area
- NRA
 - geological mapping at 1:50000 scale
 - new study of Azraq basin hydrogeology
- German Water Engineering/Arabtech
 - exploration of middle aquifer (B2/A7) of Azraq basin
- GITEC/HSI
 - exploration and resource assessment for Sirhan and Hammad basins.

2.2 Collection of Data

During the fieldwork period, one day each week was spent at the offices of WAJ and the NRA in Amman. Data were collected, ideas discussed and further data requested. Reports were borrowed from WAJ, for copying as necessary at the field centre. The data collected included:

- list of wells in the Azraq basin;
- location map for wells and boreholes in the Badia project area;